

The Year of the Linux Video Codec Drivers

Embedded Linux Conference 2017
Portland

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I have given many talks in conferences around the world. This one is special. During breakfast this morning I was reading the news, and what I read made me angry and sad. Sad that, in the 21st century, in a country where I have many friends, people who are supposed to be role models for all of us decide to discriminate between humans just for the sake of it. Before travelling to the ELC I have long hesitated on the attitude I needed to have in the face of the political turmoil of the last few months. This morning I decided to build action on top of the anger and that I simply couldn't condone the situation by staying silent. I thus want to dedicate this talk to all the people around the world who fight against discriminations of all kinds. If I could not join them on Monday when they rallied around the country, I want to show them my support and be part of the sea of pink that started marching on January the 21st. For them all, I have colored all the slides of this presentation in pink.

Video Encoding

Stateful Codecs

Stateless Codecs

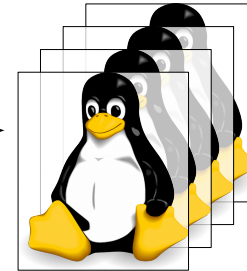
Next



The Year of the Linux Video Codec Drivers

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0111000100101001
0010101101011011
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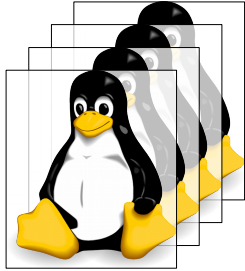
Compressed
Bitstream



Uncompressed
Frames



Video Encoding



Uncompressed
Frames



```
1010101111001011
0111000100101001
0010101101011011
1011101011000011
0111101000111100
```

Compressed
Bitstream

Video Encoding

100011010110101010111011110101111110101101011111101001001101010101101
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Video Encoding – Bitstream

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Video Encoding – Bitstream

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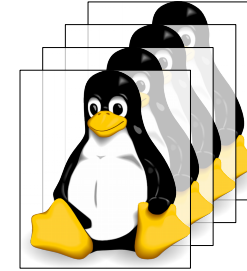
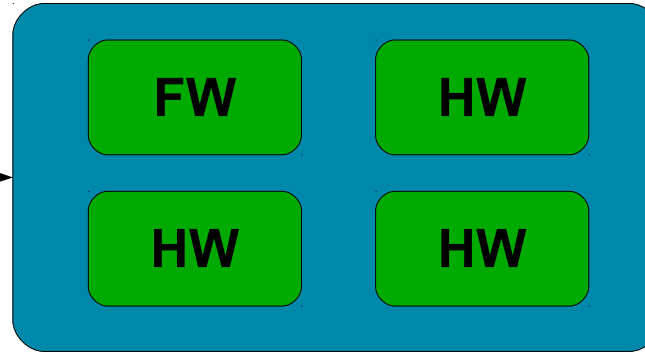
Video Encoding – Bitstream

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Video Encoding – Bitstream

0001101111001011
0111000100101001
0010100001011011
1011101011000011
0111101000111100



Video Decoder



Video Encoding – Decoder

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10111100000101 1111011001100000111101110111011001011111110000011001100
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Video Encoding – Decoder

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0111000100101001
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1011101011000011

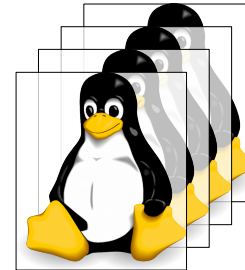
**Bitstream
Parser**

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010010100001011
011101100111010

Controller

Decoder



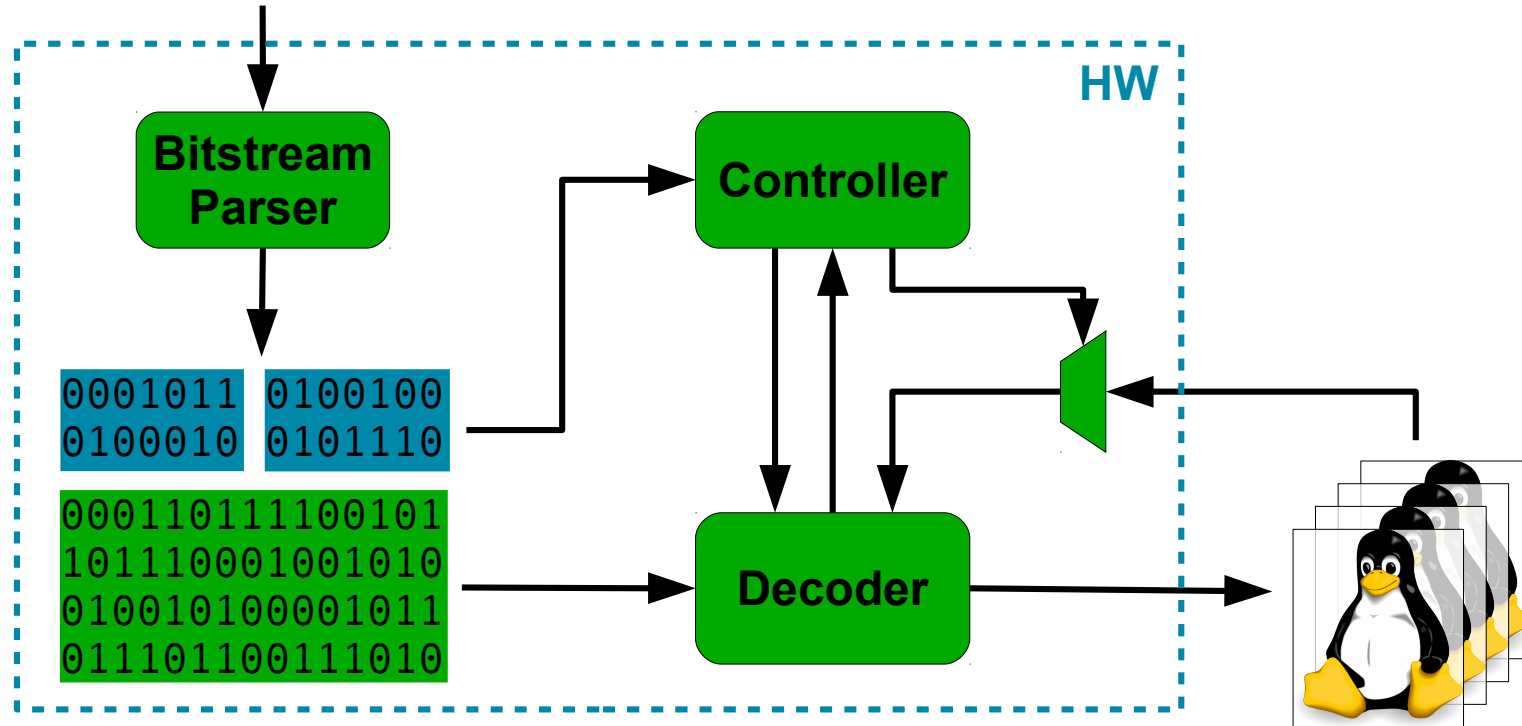
Video Encoding – Decoder

Video Encoding
Stateful Codecs
Stateless Codecs
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0001101111001011
0111000100101001
0010100001011011
1011101011000011



HW

Stateful Decoder

V4L2

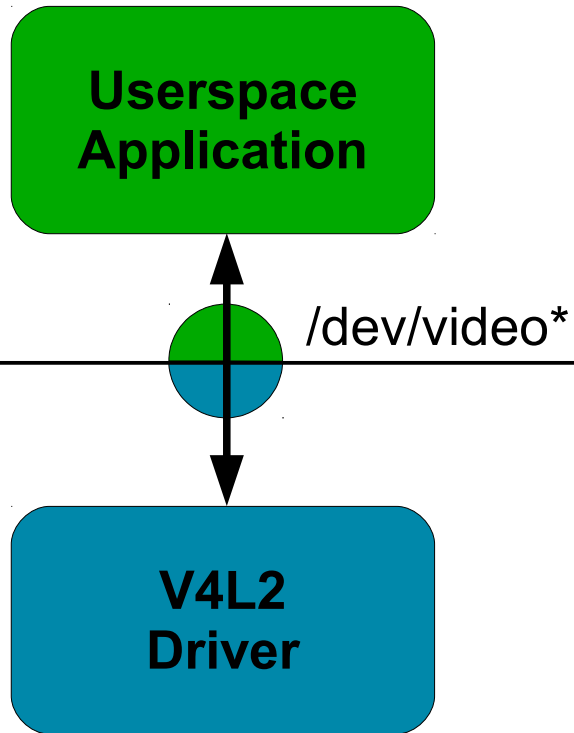


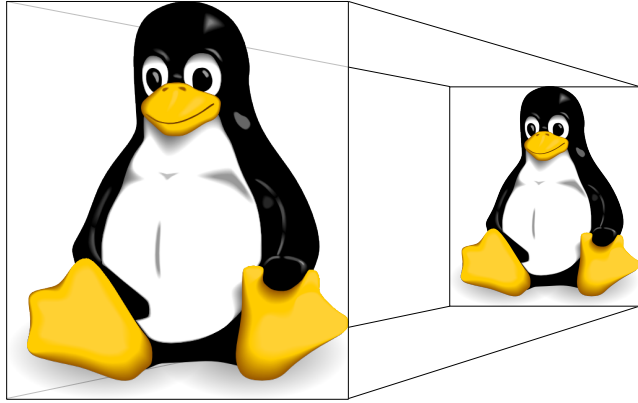
API

~~OpenMAX|IL™~~



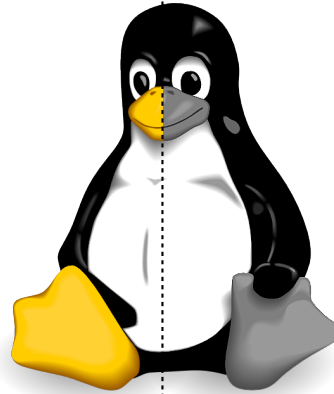
API





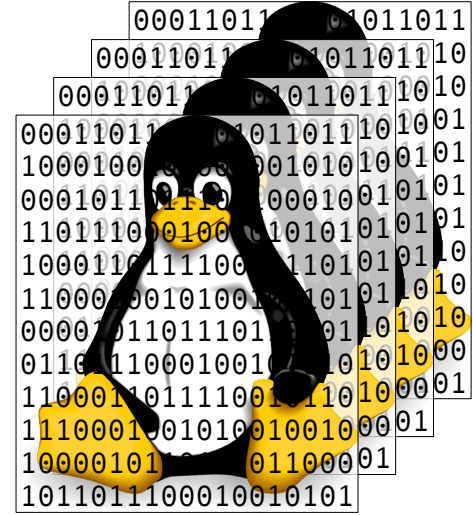
Configure Formats

Format, Crop, Compose
(H.263, H.264, VC1, VP8, VP9, ...)



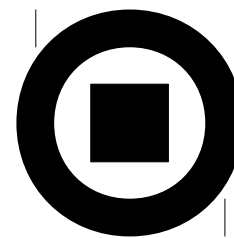
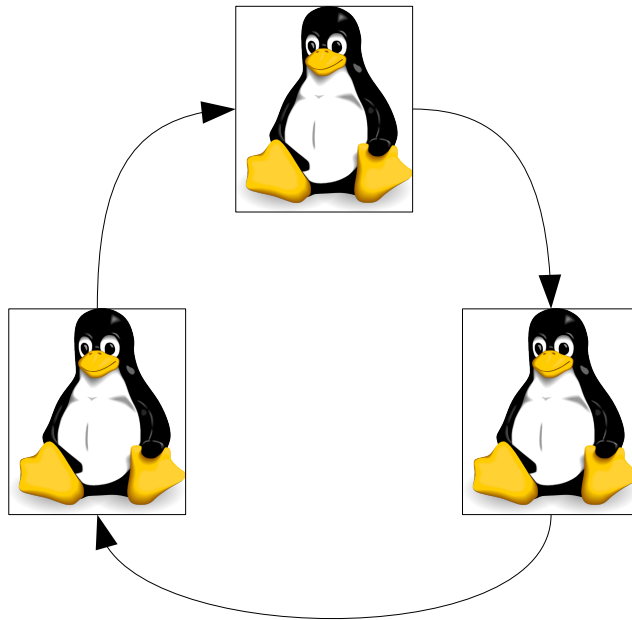
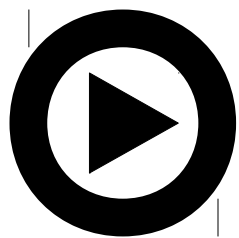
Set Controls

260 Standard Controls
Many Custom Controls



Allocate Buffers

3 Memory Models
DMA BUF



Start Video
Stream

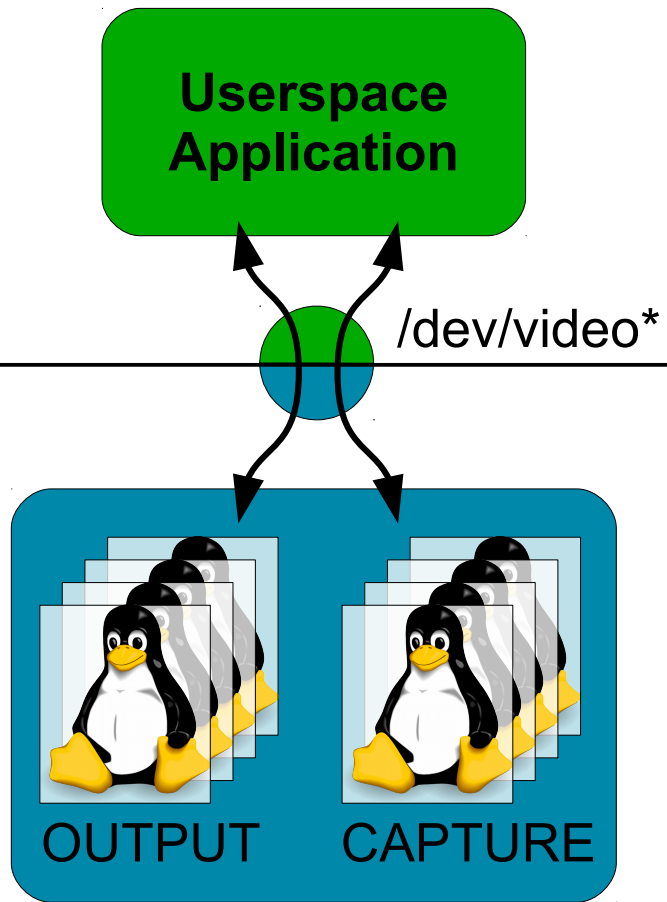
Queue /
Dequeue

Stop Video
Stream

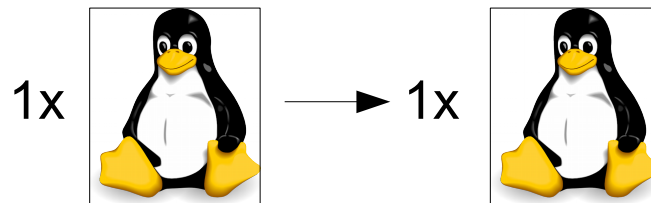
Blocking & Non-Blocking
Event Notifications

V4L2

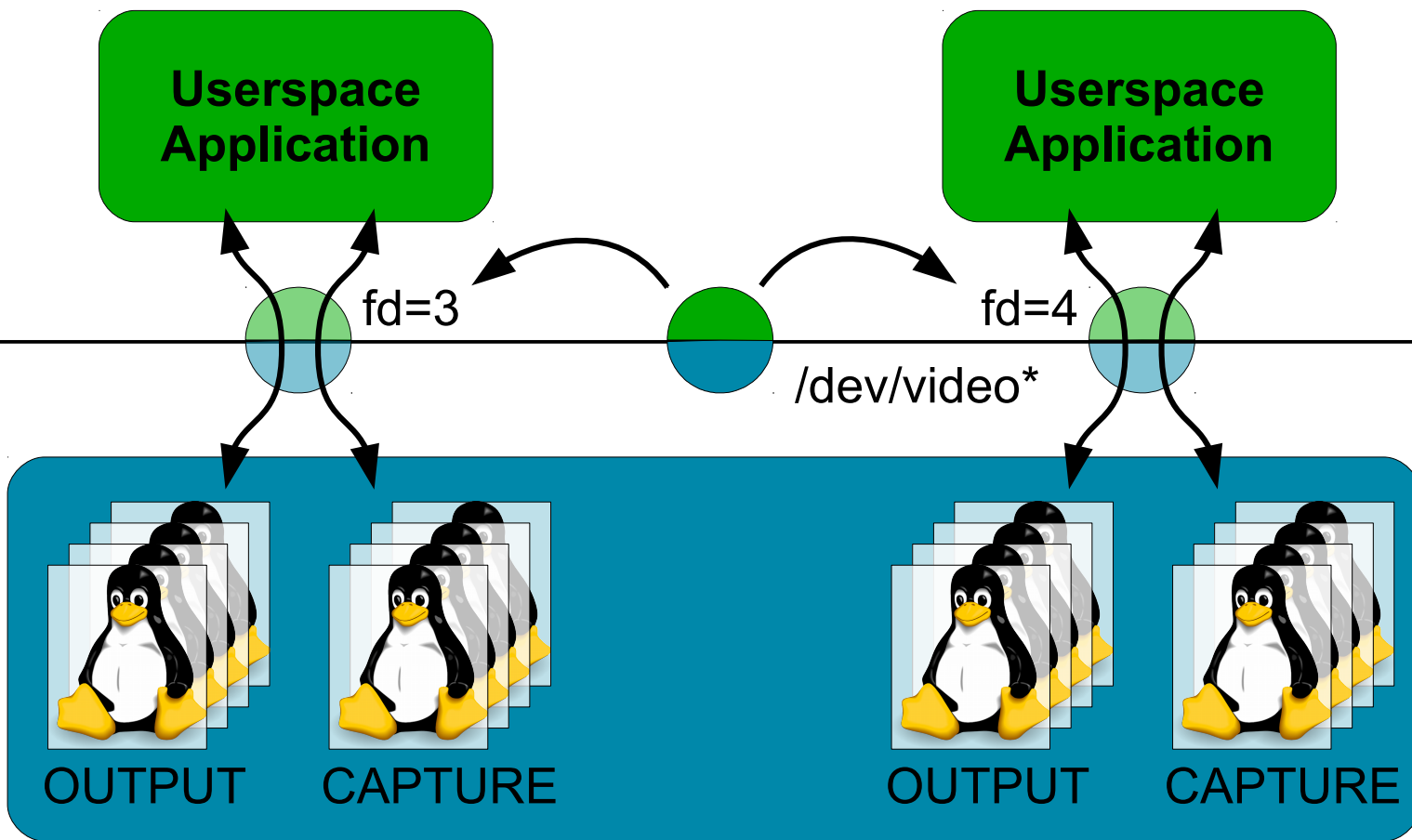
IDEAS
ON BOARD

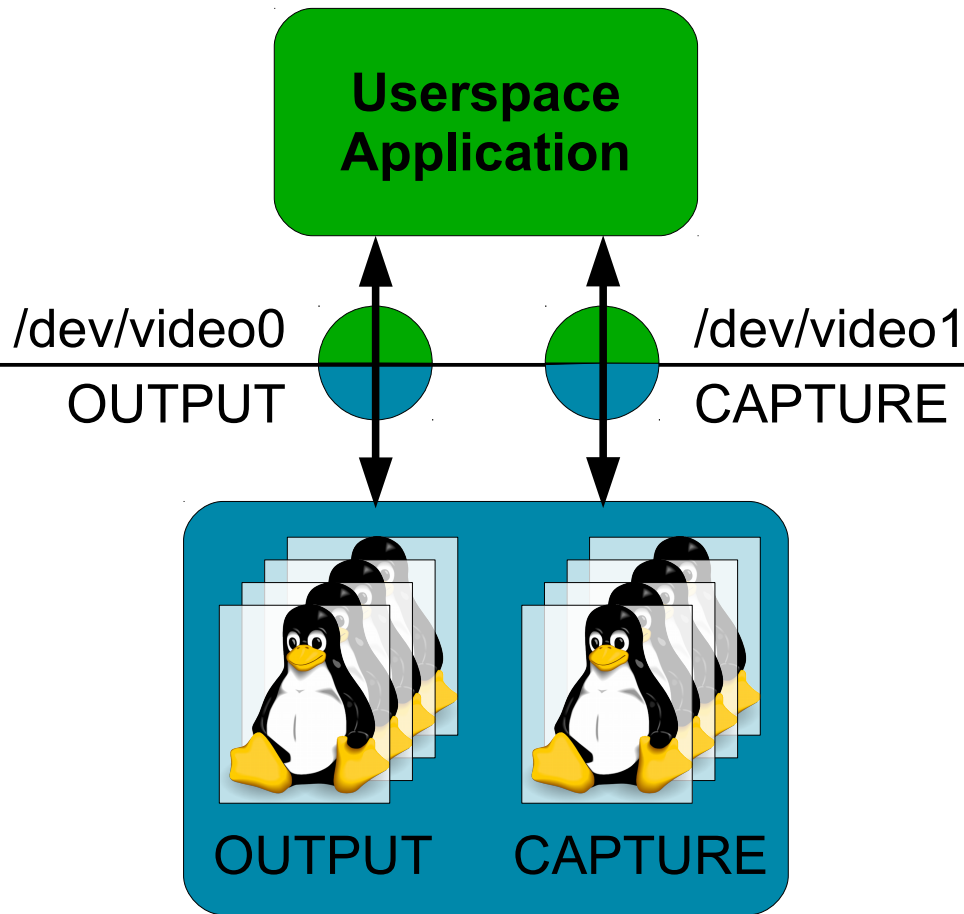


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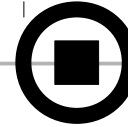
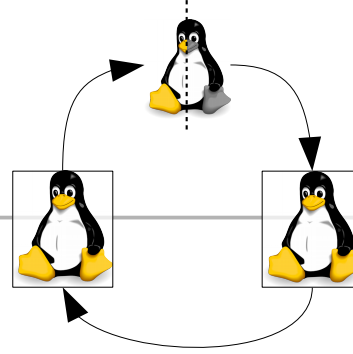
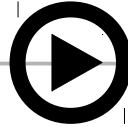
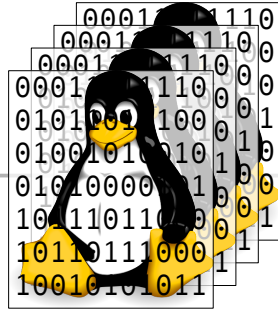
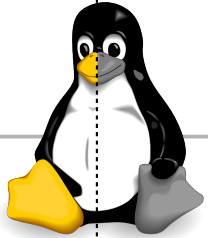
V4L2 – M2M



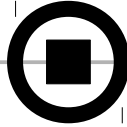
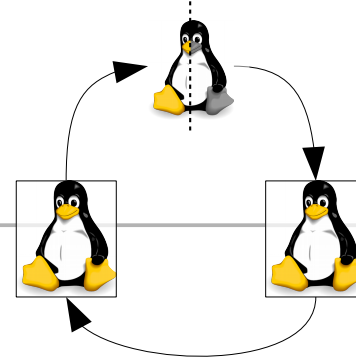
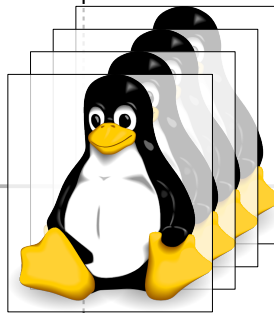
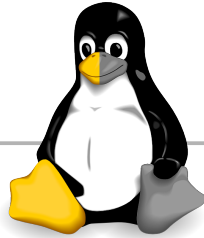


V4L2 – M2M

 OUTPUT

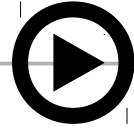
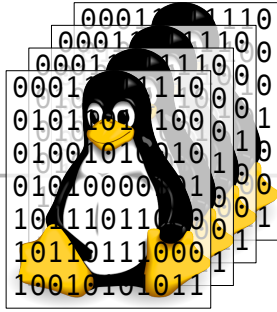


 CAPTURE

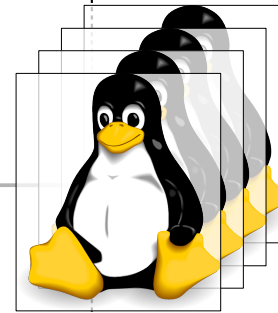
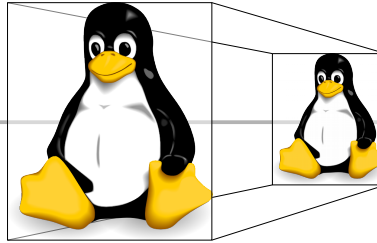




OUTPUT



CAPTURE



V4L2 – Header Parsing

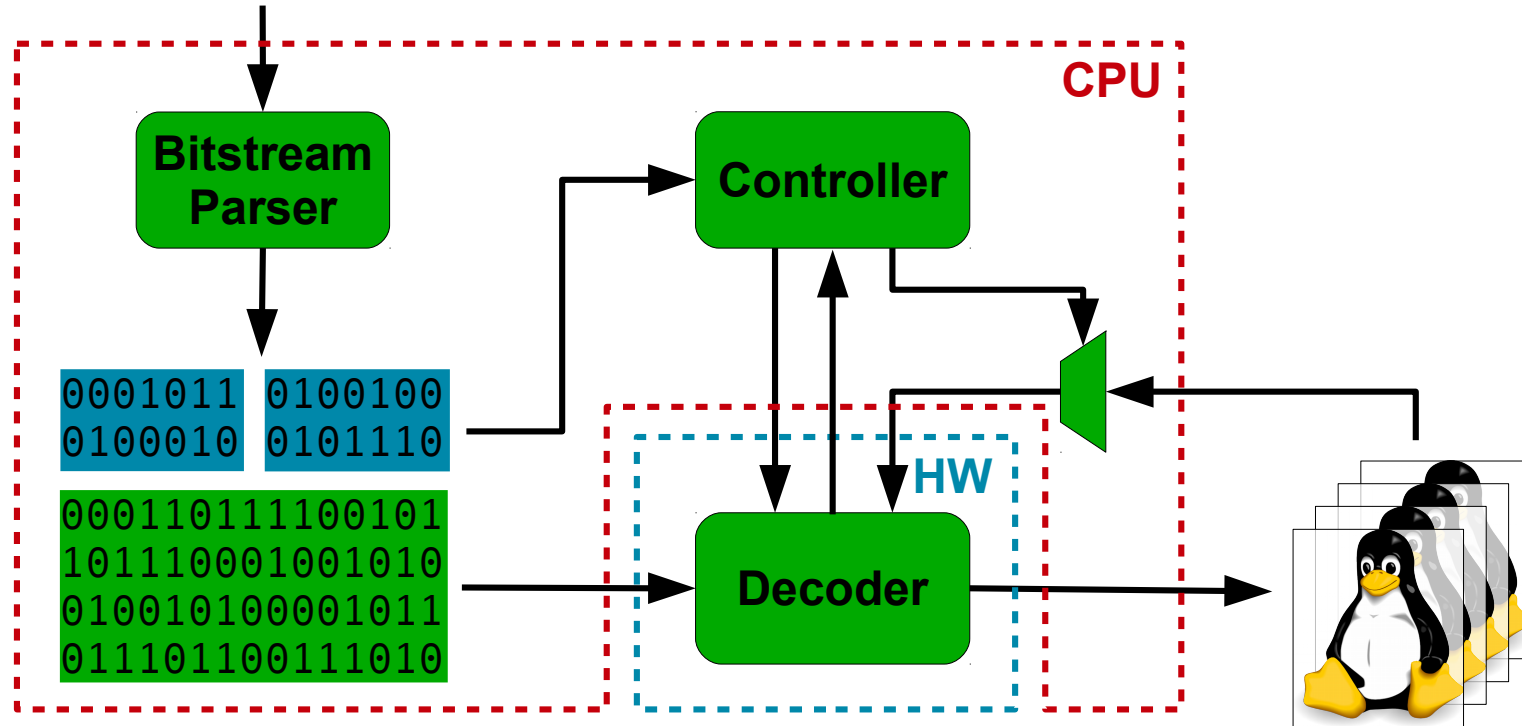
IDEAS
ON BOARD

Video Encoding
Stateful Codecs
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Next



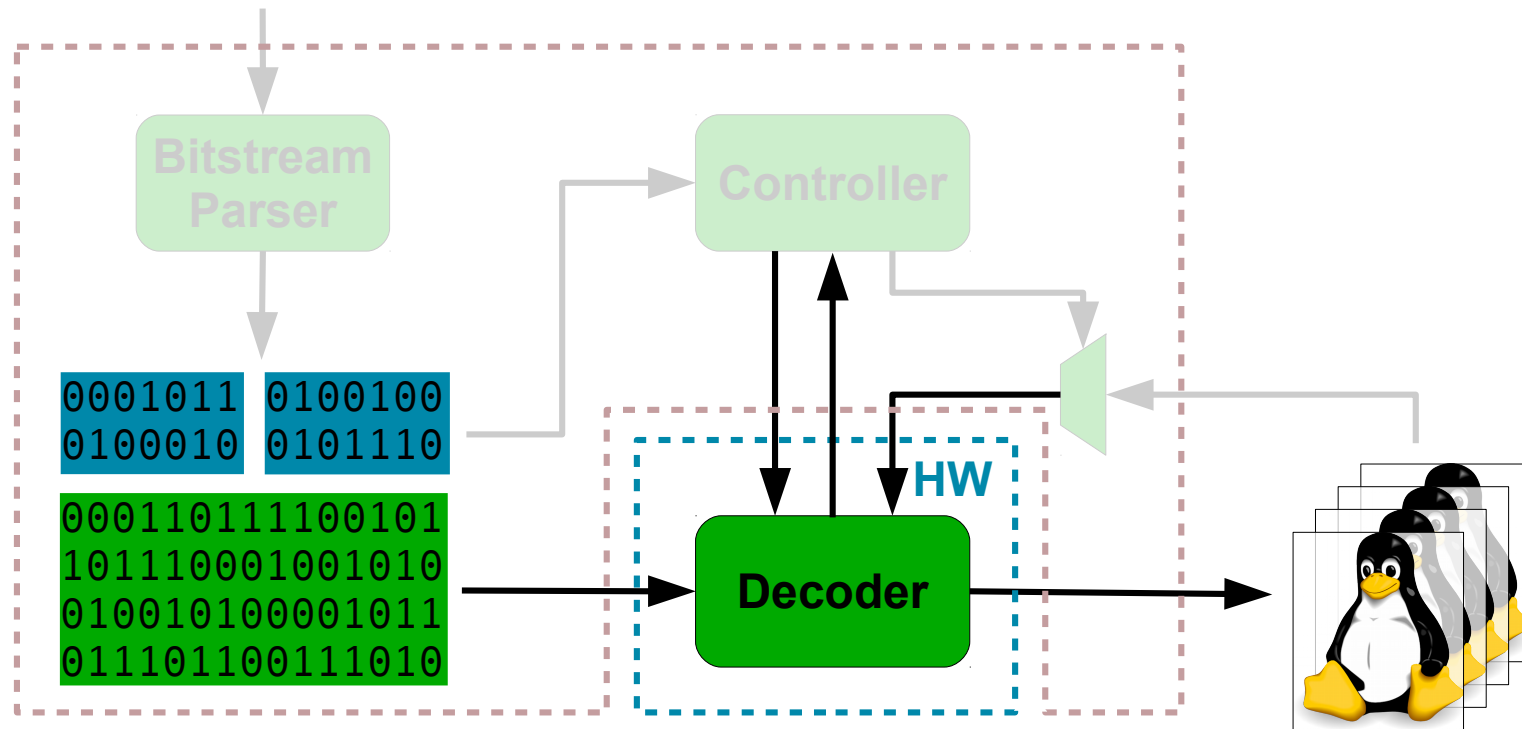
The Year of the Linux Video Codec Drivers

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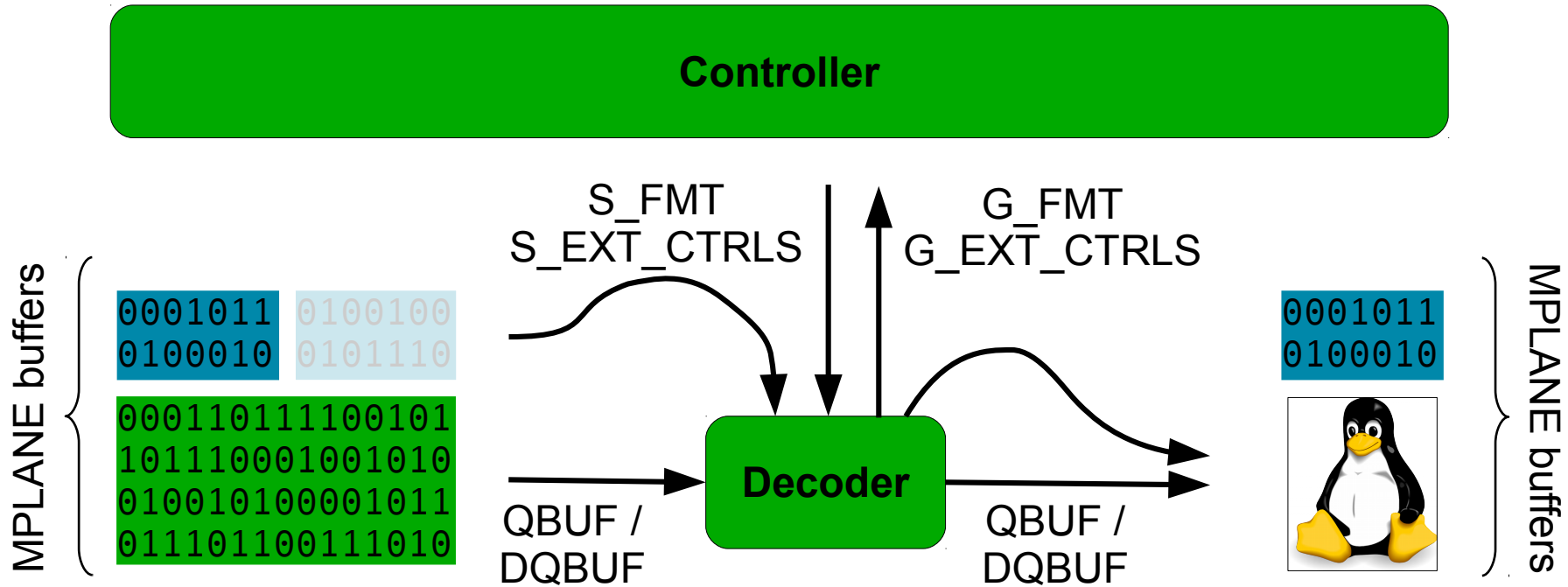


Stateless Decoder

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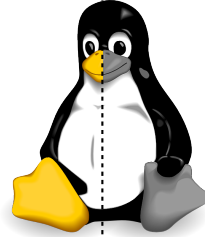
Stateless Decoder



Stateless Decoder



0001011 0100100
0100010 0101110



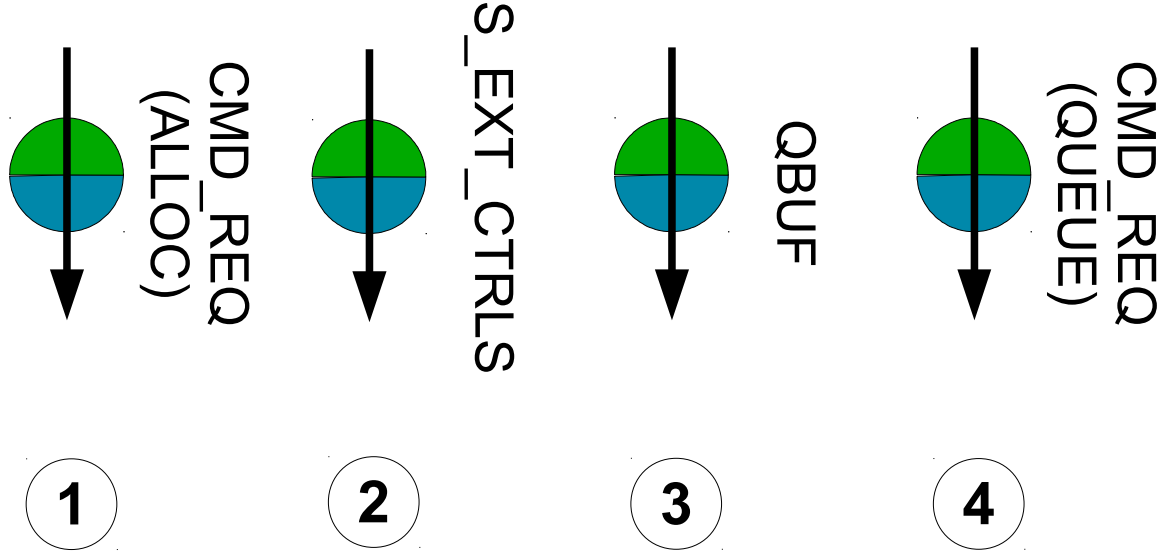
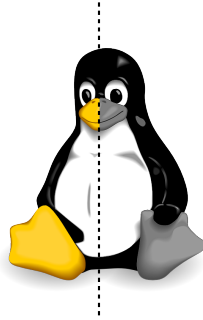
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11000101
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100001011
011101100



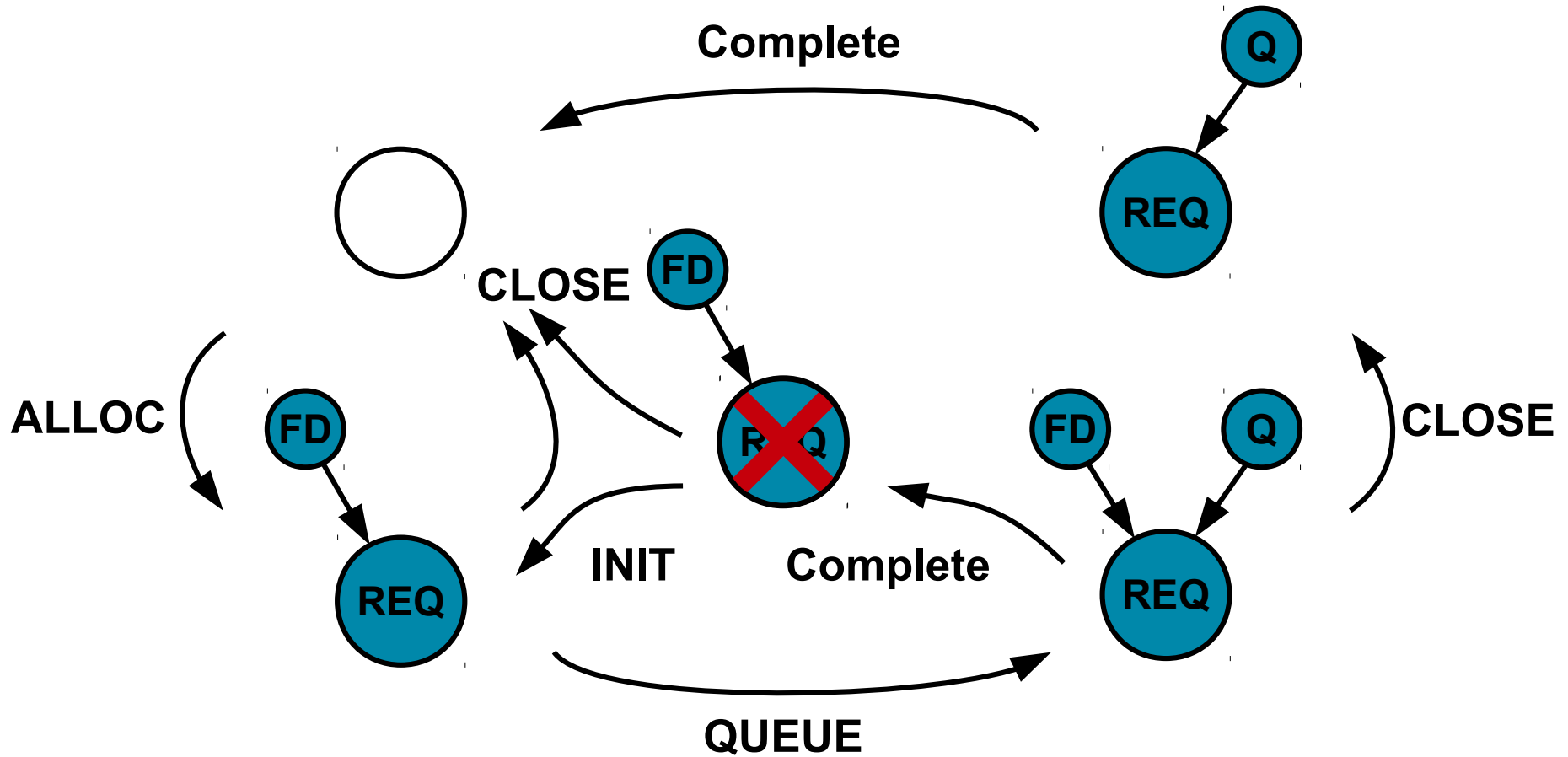
REQUEST



V4L2 – Request



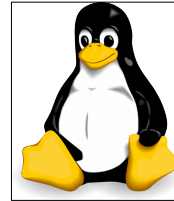
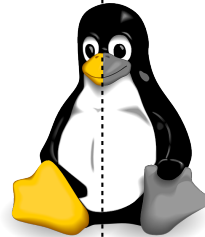
V4L2 – Requests



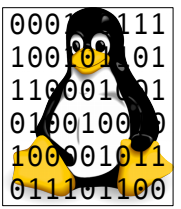
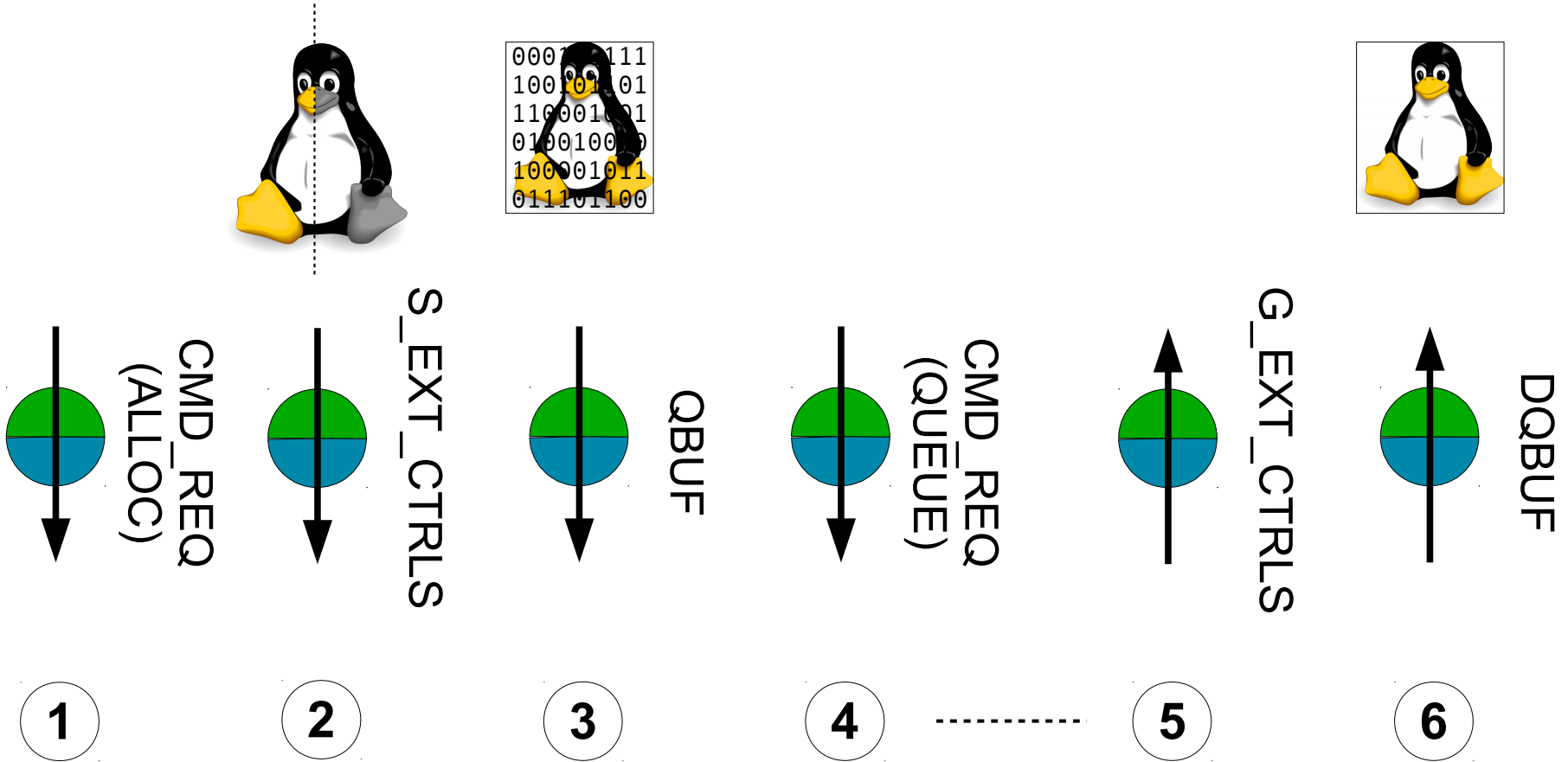
Requests Lifetime Management

REQUEST

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0100010 0101110



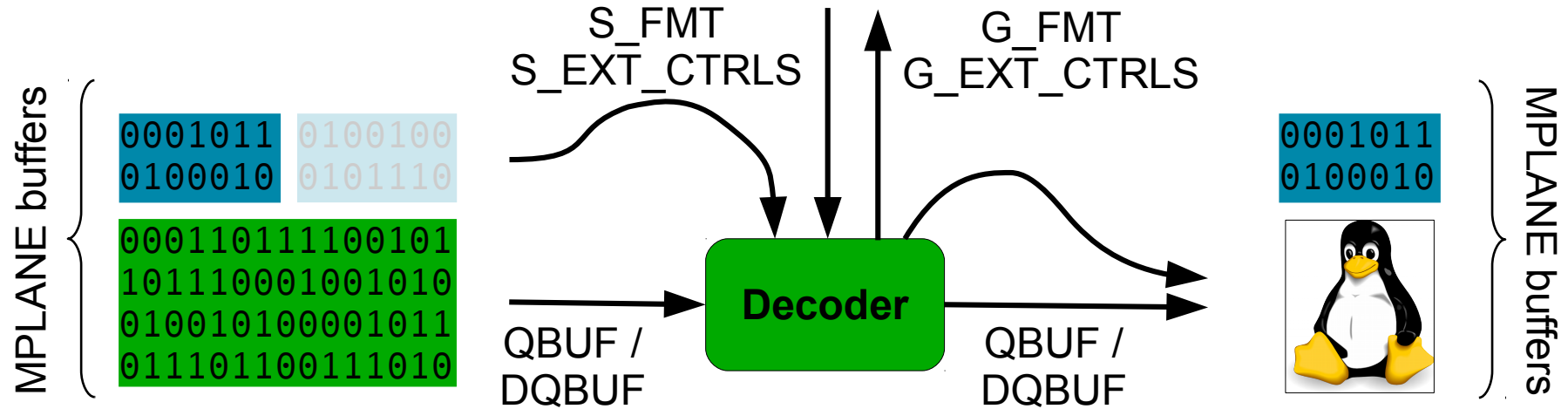
V4L2 – Requests



V4L2 – Requests

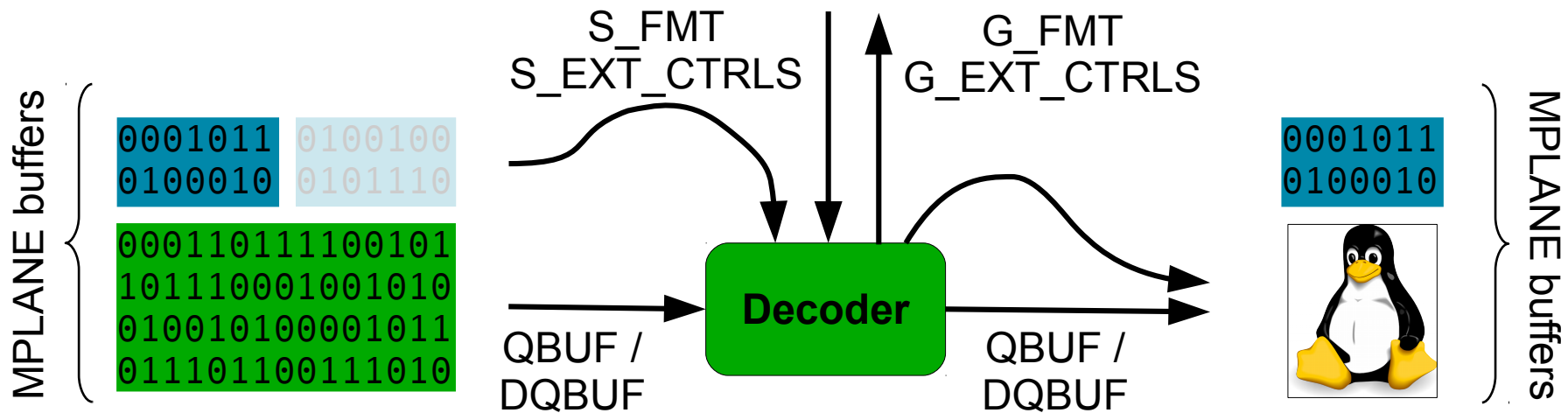
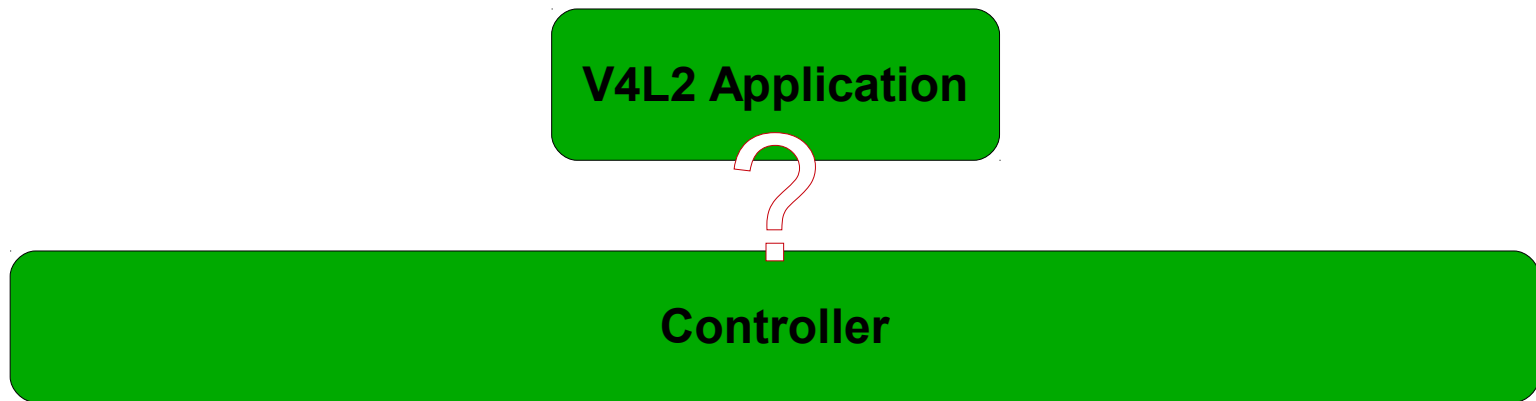
V4L2 Application

Controller

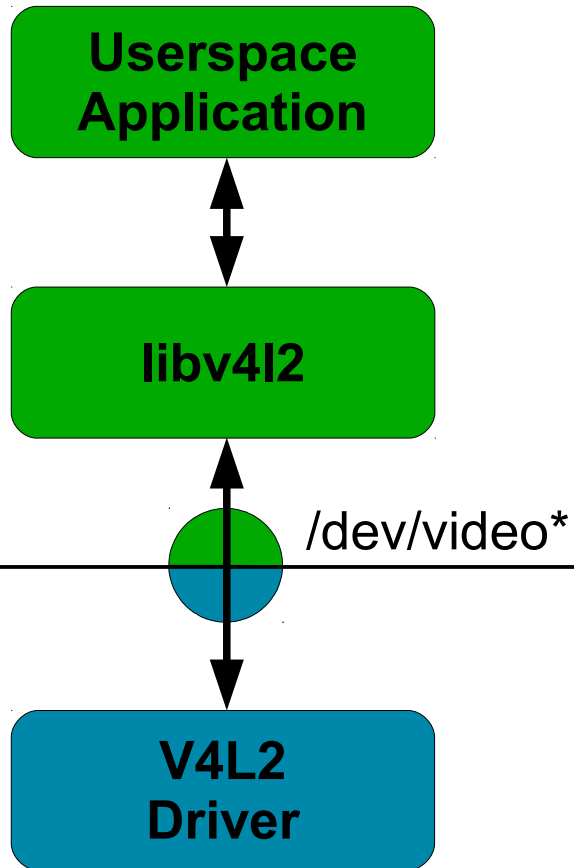


Stateless Decoder

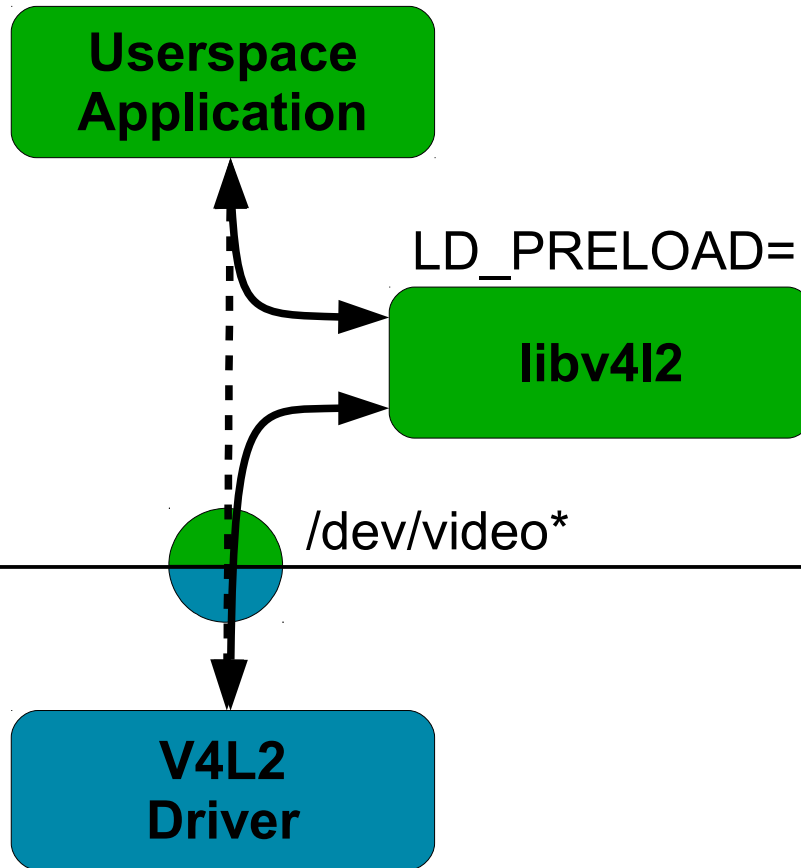
IDEAS
ON BOARD



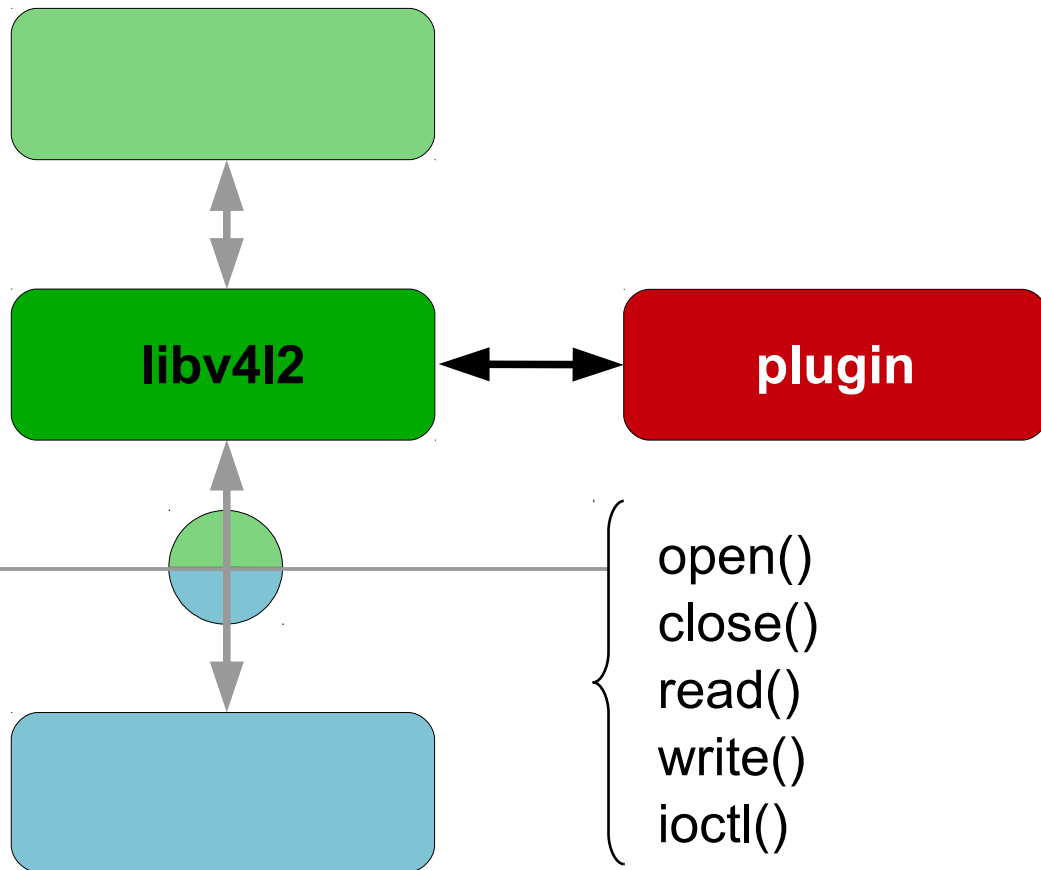
Stateless Decoder

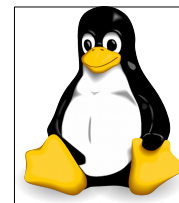
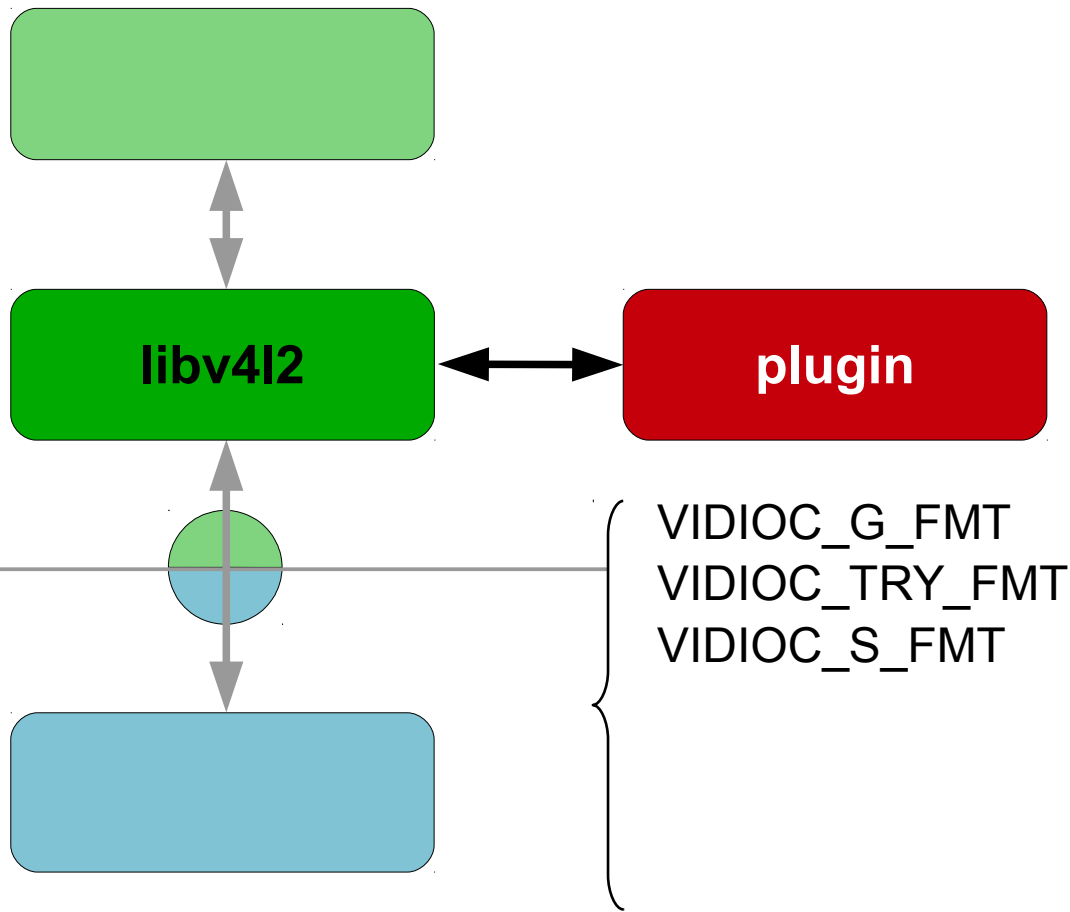


libv4l2

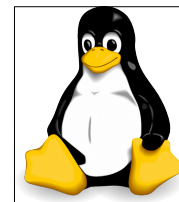


libv4l2

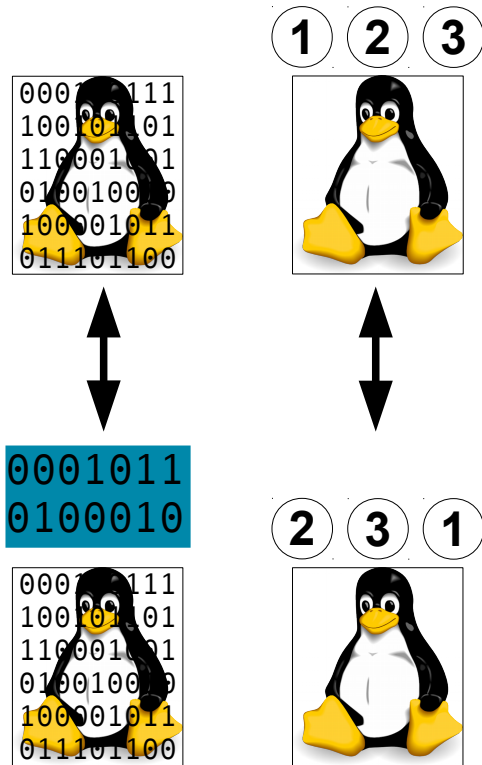
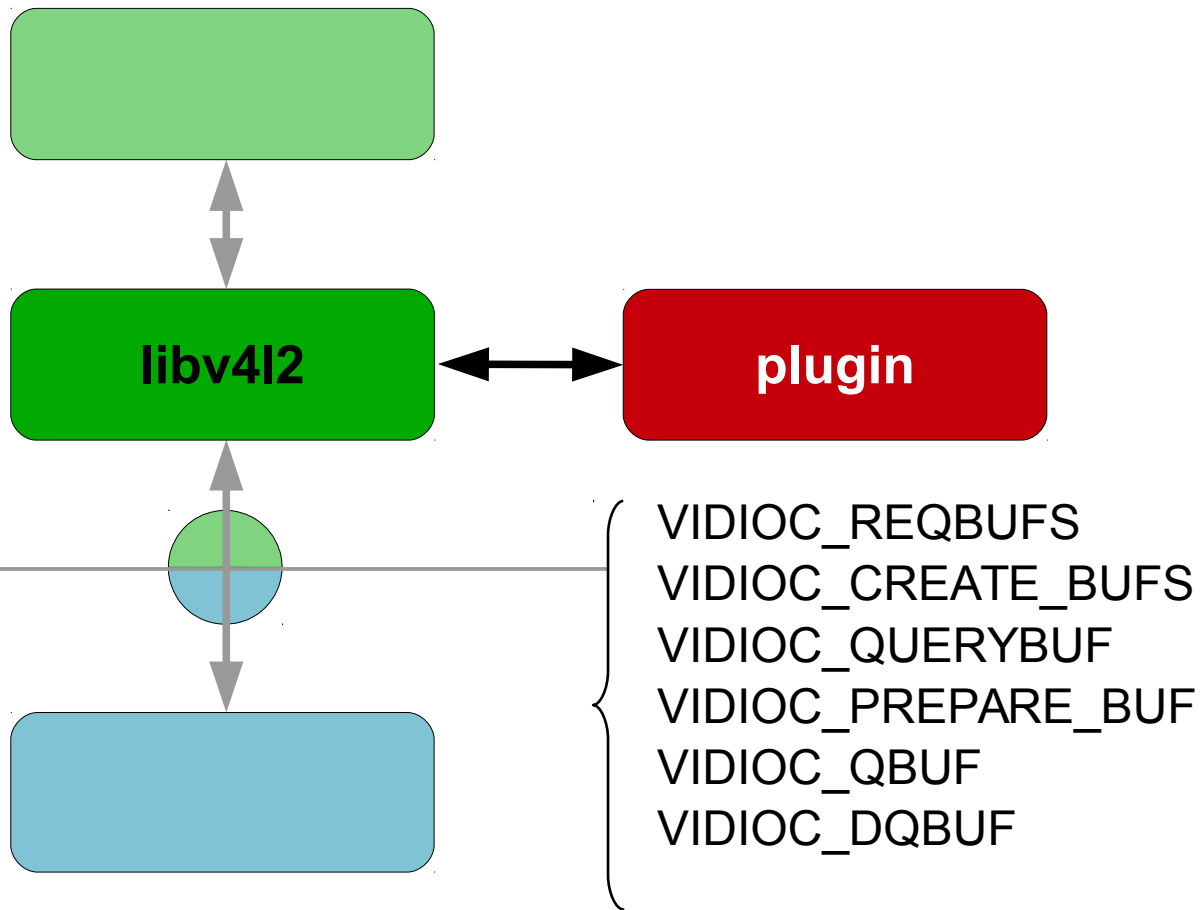


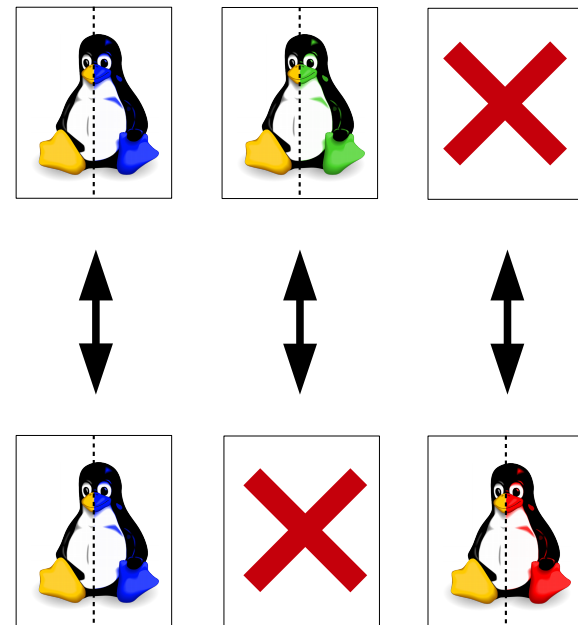
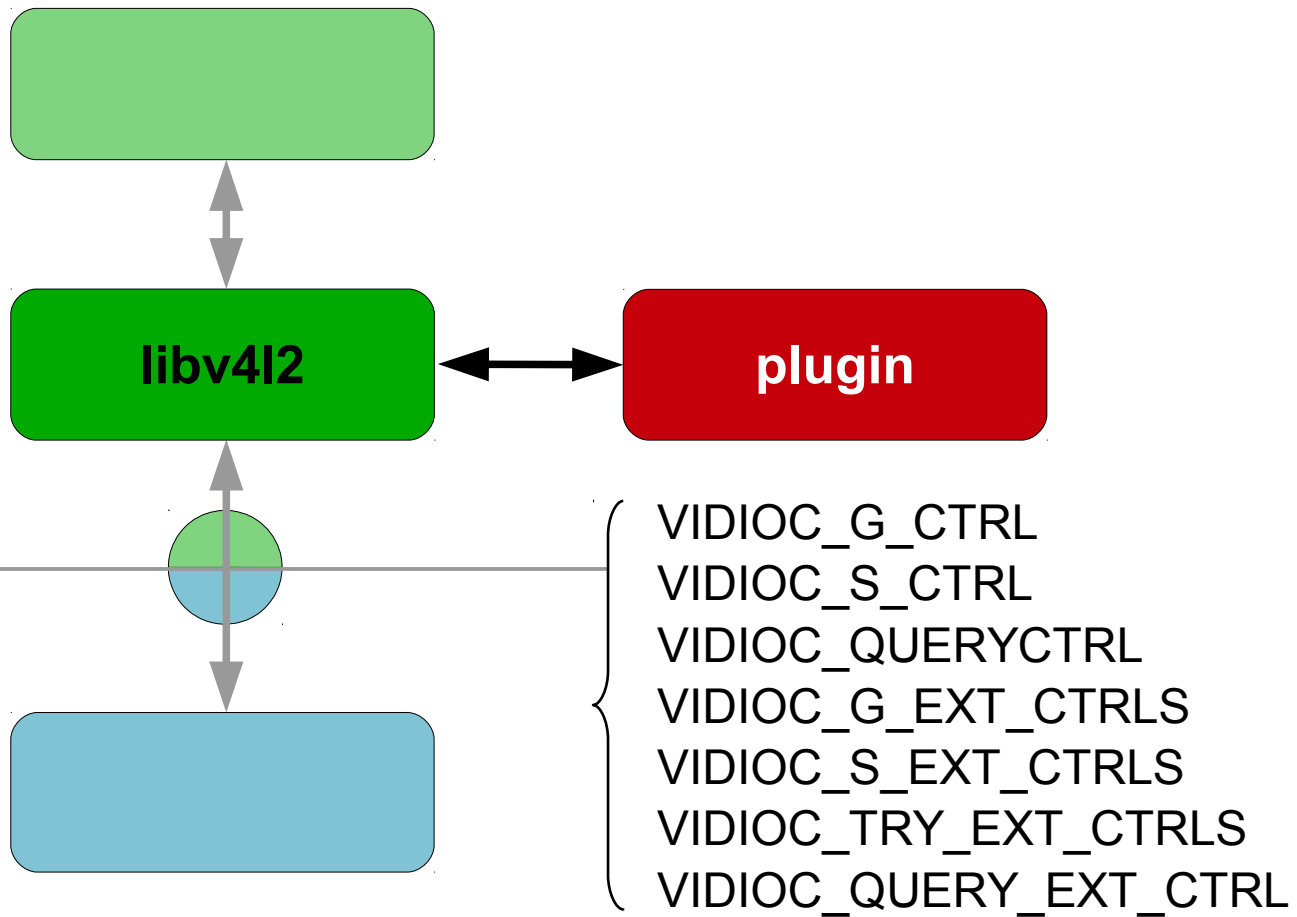


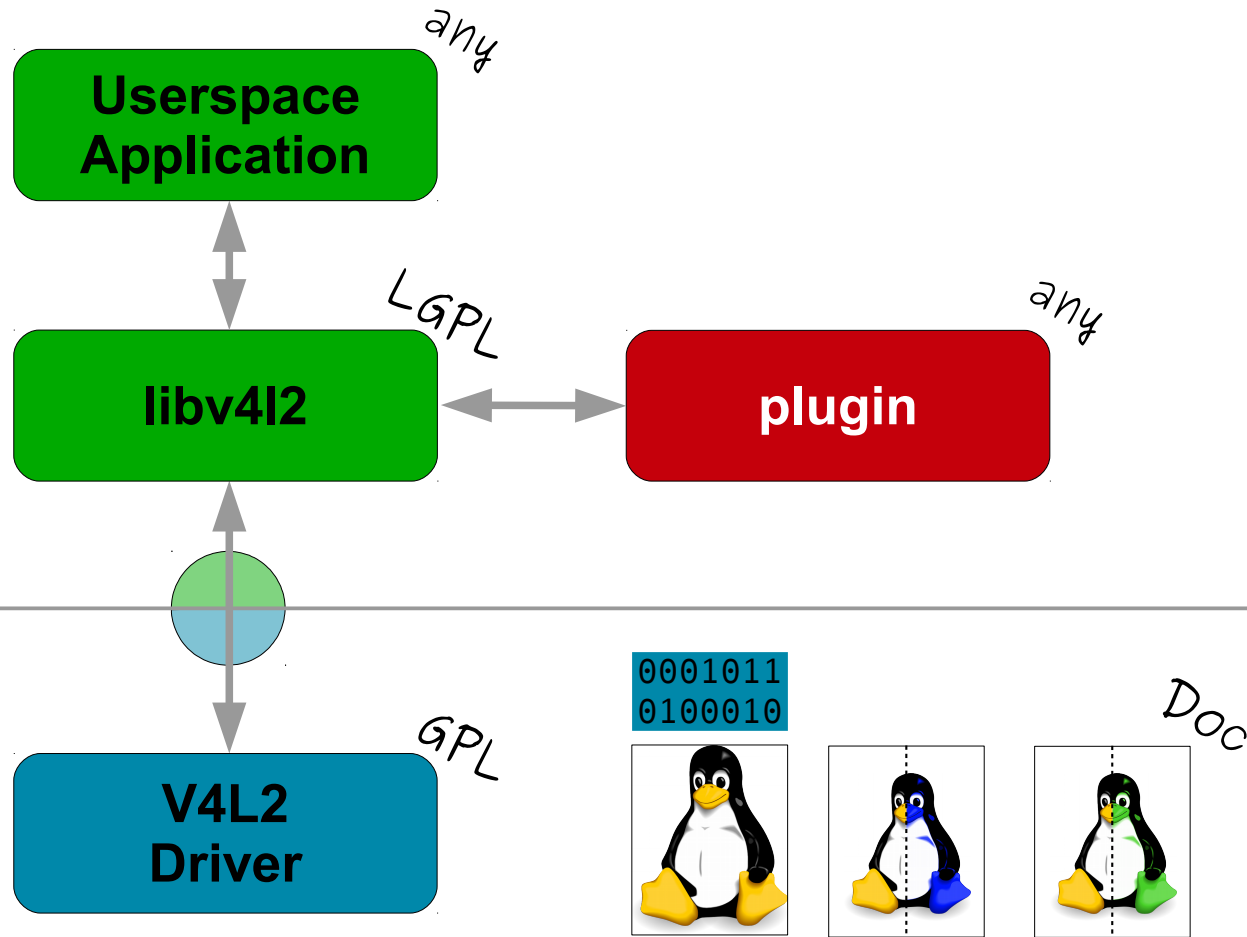
0001011
0100010



libv4l2







License and Documentation

Video Encoding
Stateful Codecs
Stateless Codecs
Next



The Year of the Linux Video Codec Drivers

RENESESAS



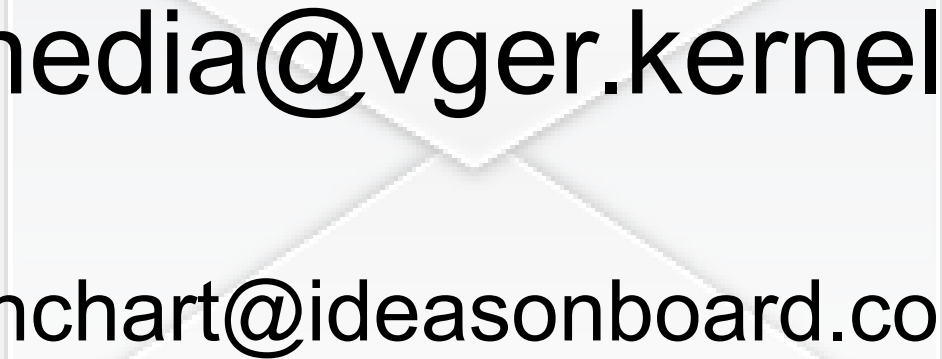
?

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- “Video4Linux2: Path to a Standardized Video Codec API”
(https://events.linuxfoundation.org/images/stories/pdf/lceu2012_debski.pdf)
- V4L2 Codec API
(<https://linuxtv.org/downloads/v4l-dvb-apis/uapi/v4l/dev-codec.html>)
- Request API and proof-of-concept implementation
(<https://lwn.net/Articles/668726/>)
- Git development branch
(<http://git.linuxtv.org/pinchartl/media.git/log/?h=drm/du/vsp1-kms/request>)



Resources

- 
- linux-media@vger.kernel.org
 - laurent.pinchart@ideasonboard.com

thx.

